

## LESSON

## 9.5

Name \_\_\_\_\_ Date \_\_\_\_\_

**Study Guide**

For use with pages 476–481

**GOAL** Use the distance, midpoint, and slope formulas.**VOCABULARY**

The **midpoint** of a segment is the point on the segment that is equally distant from the endpoints. The coordinates of the midpoint of a segment are the average of the endpoints'  $x$ -coordinates and the average of the endpoints'  $y$ -coordinates.

**EXAMPLE 1** Finding the Distance Between Two PointsFind the distance between the points  $A(-3, 7)$  and  $B(-8, -5)$ .

$$\begin{aligned}
 d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} && \text{Distance formula} \\
 &= \sqrt{[-8 - (-3)]^2 + (-5 - 7)^2} && \text{Substitute } -8 \text{ for } x_2, -3 \text{ for } x_1, \\
 &&& -5 \text{ for } y_2, \text{ and } 7 \text{ for } y_1. \\
 &= \sqrt{(-5)^2 + (-12)^2} && \text{Subtract.} \\
 &= \sqrt{25 + 144} && \text{Evaluate powers.} \\
 &= \sqrt{169} && \text{Add.} \\
 &= 13 && \text{Simplify.}
 \end{aligned}$$

**Answer:** The distance between the points  $A(-3, 7)$  and  $B(-8, -5)$  is 13 units.**Exercises for Example 1**

Find the distance between the points.

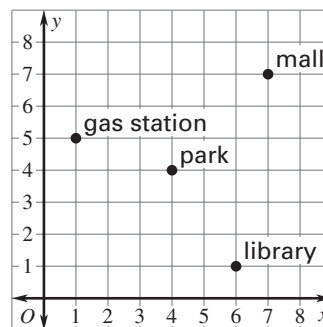
1.  $(1, 9), (8, 2)$       2.  $(-5, -6), (6, -5)$       3.  $(4, -4), (-8, 10)$

**EXAMPLE 2** Using the Distance Formula

Use the city map to find the distance between the mall and the library. Each unit represents 1 mile.

**Solution**The coordinates of the mall are  $(7, 7)$ . The coordinates of the library are  $(6, 1)$ .

$$\begin{aligned}
 d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} && \text{Distance formula} \\
 &= \sqrt{(6 - 7)^2 + (1 - 7)^2} && \text{Substitute 6 for } x_2, 7 \text{ for } x_1, 1 \text{ for } y_2, \text{ and } 7 \text{ for } y_1. \\
 &= \sqrt{(-1)^2 + (-6)^2} && \text{Subtract.} \\
 &= \sqrt{1 + 36} && \text{Evaluate powers.} \\
 &= \sqrt{37} && \text{Add.}
 \end{aligned}$$

**Answer:** The distance between the mall and the library is  $\sqrt{37}$ , or about 6, miles.

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**Exercises for Example 2**

Use the information in Example 2 to find the distance between the locations.

4. gas station, park      5. park, library      6. mall, gas station

**EXAMPLE 3 Finding a Midpoint**Find the midpoint  $M$  of the segment with endpoints  $(-5, 9)$  and  $(4, -3)$ .**Solution**

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

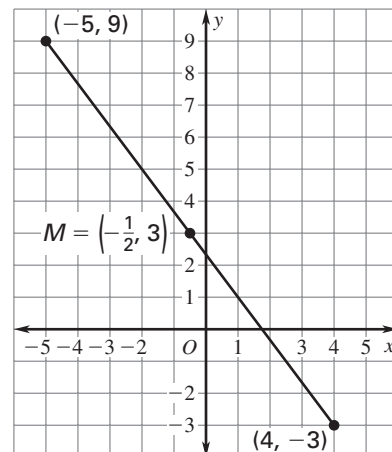
Midpoint formula

$$= \left( \frac{-5 + 4}{2}, \frac{9 + (-3)}{2} \right)$$

Substitute  $-5$  for  $x_1$ ,  $4$  for  $x_2$ ,  $9$  for  $y_1$ , and  $-3$  for  $y_2$ .

$$= \left( -\frac{1}{2}, 3 \right)$$

Simplify.

**Exercises for Example 3**Find the midpoint  $M$  of the segment with the given endpoints.

7.  $(10, 6), (2, 3)$       8.  $(-5, 11), (7, -2)$       9.  $(-11, -8), (-1, -7)$

**EXAMPLE 4 Finding Slope**Find the slope of the line through  $(-7, -2)$  and  $(-3, 5)$ .**Solution**

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope formula

$$= \frac{5 - (-2)}{-3 - (-7)}$$

Substitute  $5$  for  $y_2$ ,  $-2$  for  $y_1$ ,  $-3$  for  $x_2$ , and  $-7$  for  $x_1$ .

$$= \frac{7}{4}$$

Simplify.

**Exercises for Example 4**

Find the slope of the line through the given points.

10.  $(8, 1), (10, -1)$       11.  $(-6, -4), (3, -1)$       12.  $(-7, 9), (-13, 14)$